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ABSTRACT

A factorial design with 48 student teachers (40 were enrolled in the author's Social Studies Curriculum course at the University of California) was used to study the effect of a Social Studies curriculum course, self-confrontation on videotape, videotape-coding practice, and Guided Self-Analysis (GSA) upon the nature of teachers questions, teacher responses, total teacher talk, and teacher/pupil talk patterns. It was concluded that the GSA effected behavior change although its component parts (self-confrontation and videotape-coding) did not. It appears that the GSA induces dissonance by structuring the subject's perception in such a way that he identifies discrepencies between his ideal and his actual behavior. Behavior change is promoted by the drive for consonance and is facilitated by the operational nature of the GSA schedules. It is suggested that the ultimate test of the effectiveness of GSA as a program for professional development is not its effects upon teacher behavior, but its effects upon "pupil achievement, pupil attitude, and the development of social skills and thinking skills." Simon Fraser University, Burnaby, British Columbia, will use GSA for inservice and preservice training programs. (Author/DJB)

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GUIDED SELF-ANALYSIS AND TEACHER EDUCATION*

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SO 000 103

*The research reported here was conducted at the University of California, Berkeley.

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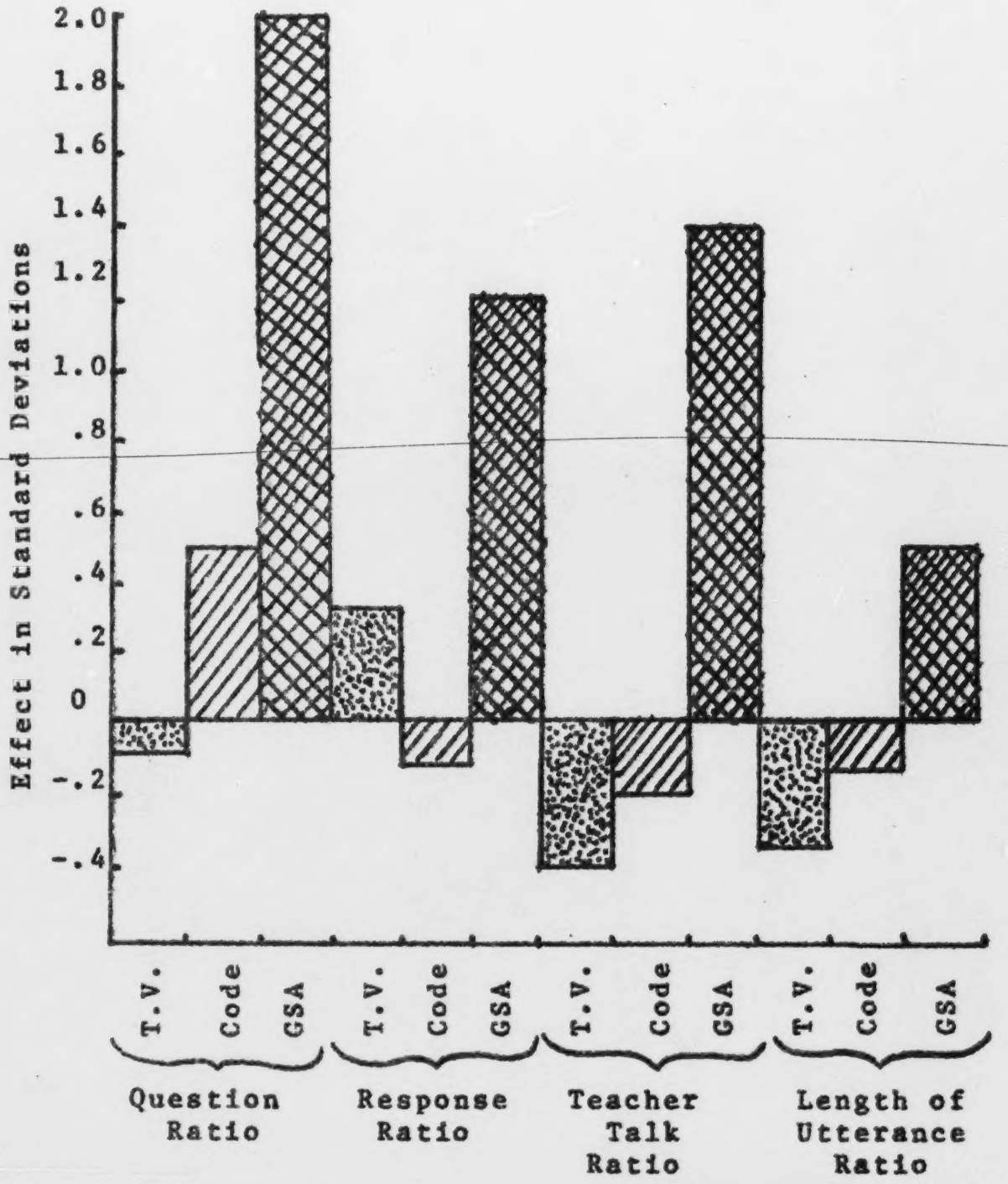
(Abstract)

A factorial design with 48 student teachers was used to study the effect of a Social Studies curriculum course, self-confrontation on videotape, videotape-coding practice, and Guided Self-Analysis (GSA) upon the nature of teacher questions, teacher responses, total teacher talk, and teacher/pupil talk patterns. It was concluded that the GSA effected behavior change although its component parts (self-confrontation and videotape-coding) did not. It appears that the GSA induces dissonance by structuring the subject's perception in such a way that he identifies discrepancies between his ideal and his actual behavior. Behavior change is promoted by the drive for consonance and is facilitated by the operational nature of the GSA schedules.



GUIDED SELF-ANALYSIS AND TEACHER EDUCATION

In supporting pupil learning an effective teacher is able to make wise selections from an extensive repertoire of teaching behaviors. Such competence requires:

1 an adequate cognitive structuring of the teaching/learning process,

2 performance skills for the achievement of objectives, and

3 a communicative relationship between the teacher's cognitive system and his behavior system.

An adequate conceptualization of the teaching/learning process will include the relationship between teacher performance and pupil performance. The teacher's interaction with pupils can then reflect his conception of his role and of teacher-pupil role relations. Frequently, however, a teacher's concept of his professional role is fashioned in some context other than the one in which he teaches. His actual teaching behavior may be guided more by the folk wisdom of teachers than by his professional knowledge. His behavior then reflects a folk-image rather than a professional image of teacher role and of teacher-pupil interaction.

A prominent goal in pre-service teacher education is the concurrent development of a conceptual framework and a repertoire of teaching behaviors. This principle of concurrence most often results in teaching practice interspersed with lectures and seminars. The student teacher is intended to come to greater understanding of teaching and learning and to apply his insights in his practice teaching. Microteaching and microsimulation are more systematic attempts to develop cognitive structure and behavior repertoire concurrently. The student teacher is presented with perceptual models (films or video tape) of desired behaviors and provided with discrimination training (cueing) to focus his attention on salient aspects of the performance. With a class of limited size the student teacher then practises the behaviors he has observed. In the microteaching setting the student teacher is expected to develop certain skills to criterion level. It is assumed that the ability to use such skills effectively will transfer to the classroom setting in which he will teach. Such an assumption may not be warranted since the stimuli impinging upon the teacher in the classroom differ from those in microteaching both in diversity and intensity.

The Guided Self-Analysis (GSA) system for professsional development provides a means of extending both the cognitive structure of the teaching/learning

process and the repertoire of teaching behaviors. The focus of such professional development is the actual behavior of the teacher in his own classroom. The teacher uses several schedules sequentially to code specific teaching behaviors observed in a video taped teaching/learning episode. Each one contributes to a cumulative profile of the teaching behaviors manifested. Use of several successive schedules permits the teacher to focus on a manageable number of categories at any one time (three to five).

Three principles are emphasized in each of the schedules of GSA Program III - Teaching for Inquiry:

1. There is a close relationship between the teacher behaviors considered in that schedule and the nature of pupil thinking;
2. The teacher who is anxious to facilitate the development of thinking skills in pupils must be sensitive to the nature of his own teaching behaviors and to the kinds of thinking those behaviors require of pupils;
3. The teacher can acquire this sensitivity by actually identifying and classifying his own teaching behaviors.

Parsons' development of the GSA is the expression of a theoretical orientation as much as it is the pragmatic development of an effective procedure. The first key concept is that of cognitive structure or cognitive map according to which an individual acts, and according to which the individual's perception of reality is determined. A second key concept is the principle of cognitive consonance, that the individual strives for consonance among his cognitions and, if an imbalance or inconsistency occurs, he will change his behavior or his perceptions to achieve consonance. A third concept is that by structuring an individual's perception dissonance can be induced and, if the means of structuring perception also operationalizes the behaviors appropriate to dissonance-reduction, behavior change will be promoted. The resultant behavior change will be related to perceptual change, i.e., change in cognitive structure. Behavior change may be further enhanced by selective reinforcement.

In order to consider the functions of the GSA in terms of theoretical principles it is necessary to identify the activities in which the teacher-observer engages.

A. First guided self-analysis

1. Record on video tape self interacting with pupils

2. View video tape of self interacting with pupils

3. Familiarize self with coding categories

4. Analyze own behavior (identify specific behaviors, discriminate between behaviors in different but related categories)

5. Sum frequencies, compute proportions, construct profiles

6. Compare profiles with interpretive figures and characterize own teaching behavior

7. Make inferences about learning consequences of observed teaching behavior

8. Formulate operational goals and make a commitment to achieving them

B. Inter-taping period

1. Observe pattern and flow of interaction in terms of a new perceptual set which involves increased awareness of own behavior and increased awarenesss of pupil response

2. Continue tentative reintegration of the cognitive map

C. Second guided self-analysis

1. - 6. Same as first time

7. Compare with own previous profiles

8. Characterize the observed changes

9. Make inferences about the learning consequences of the observed changes

10. Formulate operational goals and make a commitment to achieving them

D. Inter-taping period

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The immediate effects of recording and viewing his own behavior (A. 1, 2) will differ for each teacher depending on such personality factors as self-confidence. It is not likely to be particularly threatening, in fact many teachers

focus attention on aspects of physical appearance and general demeanor and are positively impressed by the appearance of greater poise than they anticipate.

The analysis, characterization, and interpretation of his own teaching behavior (A. 4 through 7) serves to clarify and operationalize teacher behavior in relation to pupil behavior and learning. In so doing it structures the teacher-observer's perception so that he examines the pattern and flow of interaction, and especially the nature of his own behavior, in terms of a professional image rather than a folk image of teacher functioning. However, at any one time he is focusing intensively on a very few categories of behavior and tallying the frequency of their occurrence. Consequently, when he summarizes and interprets his observations, he is unable to dismiss the discrepancies between his own observed behavior and his increasingly operationalized ideal. The observed discrepancies induce substantial dissonance, contribute to intrapsychic tension and a generalized goal of tension reduction. The tension can only be reduced by lessening the dissonance which in turn depends upon reducing the gap between ideal and observed behavior.

The GSA procedure itself directs the participant to the solution for his tension. The very procedure which enables him observe discrepancies between ideal and observed behavior, requires him to conceptualize those behaviors in operational terms and to repeatedly test his grasp of that conceptualization by using it to make decisions about the category in which to tally elements of his own behavior. Hence, he knows precisely what behavioral changes he must make in order to reduce observed discrepancies. The generalized goal of tension reduction can be transformed through goal clarification into a positive motivation to achieve specific behavioral changes. This effect is enhanced by the requirement that the teacher-observer not only characterize his observed behavior but that he make a written commitment to himself regarding specific behavioral changes he desires to make.

The behavior categories and their relation to children's thinking and to the flow of classroom interaction may have challenged some aspects of the teacher's folk wisdom about teacher behavior. By so doing they have introduced dissonance into his cognitive map, dissonance which can only be resolved by reintegration of the map. Comprehension of the coding schedules and their application to the analysis of his own behavior will make them candidates for a prime place in his conceptualization of classroom interaction. Tentative reintegration of the cognitive map will be proceeding throughout the process of self-analysis. The cognitive map will incorporate elements from the coding schedules and will probably tend toward the overall conceptualization reflected in them.

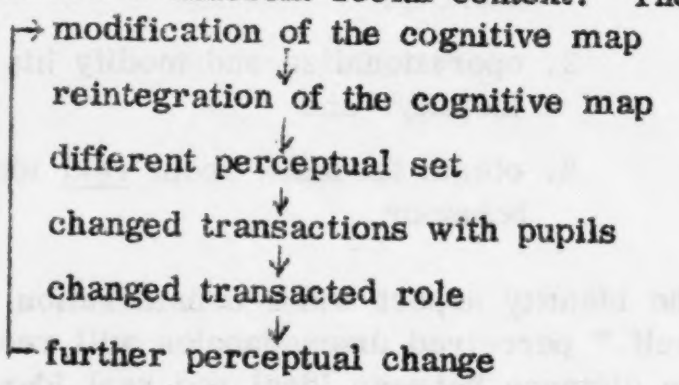
Serious attention to the modification of behavior will take place in the inter-taping period. The revised cognitive map activates a changed perceptual set so that elements of interaction are now differentiated of which the teacher would

previously have been unaware. More strongly positive and negative values are associated with specific behaviors than previously and the manifestation of those behaviors is accompanied by feelings of satisfaction or of guilt. In this way selective reinforcement contributes to the restructuring of behavior. Efforts to reintegrate the cognitive map continue and are affected by perceptions of the consequences of changed behavior.

The second guided self-analysis reinforces the effects of the first. The dissonance will be reinforced by observed discrepancies between desired and observed behavior. The corresponding intrapsychic tension will be increased, particularly for those who may have expected to observe dramatic behavioral change. Some may find that their behavior appears to be less productive than on the previous occasion and that will further heighten anxiety even though a person might be expected to be ineffective initially in the attempt to use unfamiliar behavior patterns. The perception of operational goals is also reinforced.

An element of much greater significance in the second analysis than the first is the selective reinforcing effect on elements of behavior change. Change in a desired direction is documented and its very identification contributes to a feeling of satisfaction which tend to reinforce the observed behavior and increase the probability that it will occur more frequently. The resulting positive motivational force will occur more frequently. The resulting positive motivational force will interact with the motivation to reduce dissonance in the ongoing process of reintegrating the cognitive map and reorganizing the system of expressive behavior. Even perceived dissonance reduction in terms of reduction of the discrepancy between desired and observed behavior will serve as positive reinforcement for continuing behavior change. To the extent that a teacher's perception of the behavior analyzed is consistent with his cognitive map, the reintegration of the map is reinforced.

Operant conditioning in which the consequences of behaviors are modified in order to modify the behavior is activated to some extent in the GSA procedure. That is, modified behavior tends to create a different social context. The process might be summarized as follows:



More rewarding transactions with pupils (social consequences of behavior change) will provide positive reinforcement of the operant behaviors. The change becomes self-reinforcing.

The application of theoretical principles in the GSA procedure may be summarized as follows. Each teacher has a unique mazeway or assumptive world which, in large measure, determines what he will perceive and what he will regard as significant in the world around him. One of the mechanisms by which a person maintains cognitive consonance is this tendency to perceive that which confirms his images of self and others. The GSA structures his perception according to a different set of assumptions and the process of coding his own behavior requires that he perceive phenomena which challenge his own assumptions and confirm those inherent in the procedure. Moreover, he confronts himself with major discrepancies between his cognitive map and his expressive behavior. Dissonance is induced within the cognitive map and between the map and the system of expressive behavior.

The teacher is willing to tentatively adopt the assumptions implicit in the GSA because they are in some measure congruent with his professional knowledge even though that knowledge has not extensively penetrated his folk wisdom. It has not been operationalized and incorporated in his actual teaching behavior. Although, at a superficial level, he may have selectively perceived "evidence" of his professional functioning, a folk image has dominated his actual behavior. His professional knowledge may represent an area of the mazeway that is not available to guide his behavior in the classroom. Reintegration of the cognitive map involves not only the incorporation of new elements but the activation of old elements as new relationships are perceived.

The participant's role as a teacher is a dominant aspect of his identity when he is functioning in the classroom. In terms of Wallace's postulates about identity, the GSA enables the observer to

1. operationalize and modify his perception of <u>ideal</u> identity,
2. operationalize and modify his perception of <u>feared</u> identity, and
3. obtain feedback about <u>real</u> identity, i.e., observed behavior.

Since the identity aspect under consideration is highly salient, i.e., it is close to the "core self," perceived discrepancies will result in considerable identity work to reduce the distance between ideal and real identity. Once the discrepancy has been brought to the level of conscious awareness, the participant's self-esteem depends

on reducing that discrepancy. The resulting identity work is directed toward obtaining feedback justifying the resetting of real identity at a more acceptable level and the operational nature of the concepts incorporated in the GSA will be a major determinant of the nature of the identity work. Furthermore, since identity work is effort designed to bring into the perceptual field feedback giving evidence of reduced distance between ideal and real identity, the provision of such feedback in the course of repeated self-analysis will serve to positively reinforce appropriate behavior change.

Purpose of the Study

The purpose of this study was to identify the treatment effects of specific elements in the GSA procedure on the verbal behavior of pre-service intermediate teachers. Program III - Teaching for Inquiry (Parsons and Smith, 1968) was selected as representative of the GSA procedure. Although the method could conceivably be used to promote change in any aspect of behavior, the program investigated focuses on the verbal behavior of teachers and, to a lesser extent, of pupils. Three factors are incorporated in the method and are therefore, of interest in the study:

1. self-confrontation using video tape,
2. coding behavior using a systematic scheme, and
3. self-coding, the actual coding of one's own teaching behavior.

The rationale for the GSA approach suggests that the effects of the three factors will be additive and that the actual coding of one's own behavior will show the greatest effect since it will enhance the effects of the other two factors.

The criterion variables used in testing hypotheses were indices of interaction derived from sixteen variables in four categories:

1. questioning strategies
2. response strategies
3. total teacher talk
4. teacher/pupil talk patterns

The GSA was developed for use with experienced teachers in an in-service training program. In this study it was used in conjunction with a pre-service teacher education course in social science curriculum. Since the effect of the course could possibly confound the effects of factors in the GSA procedure, the study was designed to identify the effect of the curriculum course in addition to the three treatment factors in the GSA system.

Hypotheses

The major research hypothesis could be stated generally as: There are no statistically significant treatment effects on the verbal behavior of pre-service intermediate teachers.

Five effects were of interest:

1. inquiry orientation (the Social Science curriculum course)
2. self-confrontation (on video tape)
3. coding (the use of schedules to code teaching behavior other than their own)
4. self-analysis (the full GSA treatment)
5. interaction of self-confrontation and coding

Since the dependent variables were six indices of interaction (general index, questioning index, response index, teacher talk index, and total talk index, and length of utterance index), the test for treatment effects on the general index of interaction became the test of the major hypothesis. Multivariate tests for treatment effects on the other five indices were tests of subsidiary hypotheses.

METHOD

The Sample

Subjects were forty University of California student teachers enrolled in the investigator's Social Science curriculum course and student teaching in third, fourth, fifth or sixth grade classrooms. A table of random numbers was used to assign the forty students to five treatment groups of the basic design. Inspection revealed the groups to be similar on such criteria as average grade level of school placement and proportion of subjects in urban schools.

Eight student teachers had either entered the program with advance credit or had enrolled in a Social Issues Course as an alternative to the Social Science Curriculum course. The eight were used as subjects in a sixth group, a no-treatment control group included to enable the investigator to estimate the effects of the curriculum course. Since these subjects were not randomly assigned but were, in an indirect way, self-selected it cannot be assumed that they were drawn from the same population as the other forty subjects. Therefore, findings resulting from their inclusion in the analysis are considered to be highly tentative.

With a sample of limited size the assumption of equivalence on the basis of random assignment is tenuous. For this reason video tapes of all subjects were obtained at the outset and analyzed to obtain measures on the criterion variables. Multivariate analysis of variance revealed no statistically significant differences between the six groups.

The Design

A randomized factorial design was used to identify the effects of three factors inherent in the GSA. Each factor had only two levels since it was either included in the treatment or excluded from it. A complete three factor design would comprise eight subclasses or cells in a 2 x 2 x 2 layout. However, since the inclusion of self-coding is dependent upon the other two factors, three cells are eliminated. The resulting incomplete factorial design comprising five subclasses is adequate for the analysis and estimation of effects.

The necessity of estimating the main effect of a fourth factor, the curriculum course, could change the design to a 2 x 2 x 2 x 2 layout with sixteen subclasses. However, only one group was added, a no-treatment control group, to permit tentative estimation of the effect of the curriculum course. The basic design is represented in the upper half of Figure 1. The theoretical extension of the design is indicated by broken lines and the lower right hand cell represents the "no-treatment" control group.

Equipment and Materials

GSA schedules. Subjects used schedules A, B, C and D of GSA Program III, Teaching for Inquiry.

Video tape recording equipment. Both data collection and experimental treatment required the use of video tape recordings. A portable Sony SV 2400 videocorder was used for classroom recording and a Sony SV 300 videocorder was used for playback. To facilitate analysis of video tape recordings studio equipmen

			C_1 Coding		C_2 No Coding		
			D_1 Self-Coding	D_2 No Self-Coding	D_1 Self-Coding	D_2 No Self-Coding	
A_1 Inquiry Orientation	B_1 Self-Confrontation		1111* n = 8	1112 n = 8	(empty)	1122 n = 8	24
	B_2 No Self-Confrontation		(empty)	1212 n = 8	(empty)	1222 n = 8	16
			8	16	0	16	40
A_2 No Inquiry Orientation	B_1 Self-Confrontation		(empty)	(empty)	(empty)	(empty)	8
	B_2 No Self-Confrontation		(empty)	(empty)	(empty)	2222 n = 8	8

*Subscript numerals refer to the level of each of the four factors A, B, C and D, respectively.

FIGURE 1

DESIGN OF THE STUDY

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was used to transcribe ten minute segments enabling the investigator to consolidate recordings of five or six subjects on a single one-hour tape.

Experimental Procedures

The independent variables in this study were three factors inherent in the GSA and a fourth factor, the Social Science curriculum course. For the purpose of the study the GSA was subdivided into self-confrontation using video tape, coding using a video tape of someone else and self-coding or self analysis. The curriculum course was designated as inquiry orientation.

The schedule of treatments for each of the six subclasses is summarized in Figure 2. Several factors combined to shorten the treatment period to six weeks for some subjects. The fourth or final video tape was not obtained for five of the eight subjects in the full treatment (GSA) group which meant that the "post-treatment" analysis was carried out on their third tape. This difficulty was compounded by the fact that GSA Schedules C and D were not printed in time for the outset of the experiment so subjects could not be trained in their use until late in the experimental period. In fact, subjects in the full treatment group did not use Schedule D for self-coding until their third tape. Thus the effects of that schedule are not evident in the data. This is clearly a violation of the GSA procedure since the schedules are inter-related and designed to be used sequentially on each video tape.

After a pre-treatment video tape was obtained for each of the forty-eight subjects, half of them (groups 1, 2 and 4) were given practice in the use of GSA Schedule A on a video tape of someone else. Subjects in the full treatment group (1) used Schedules A and B to code their own behavior from their first video-tape and subjects of groups 2 and 3 viewed their video tapes without coding their behavior specifically. A second training session in behavior coding (groups 1, 2 and 4) gave subejcts instruction and practice in the use of Schedules A and B. A second video taping followed for groups 1, 2 and 3 and it was followed in turn by self-coding (group 1) using Schedules A, B and C, and behavior-coding training and practice (groups 1, 2 and 4) using the same schedules. Schedule D was not introduced to these groups and only used by members of group 1 after the third video tape recording (groups 1, 2 and 3) at which time subjects in the full treatment group used all four schedules. A final post treatment video tape was obtained for all subjects but five.

Inquiry orientation. The investigator's Social Science curriculum course presented models of "inquiry-oriented teaching" by means of video tape, demonstration and activity. Teaching strategies were analyzed and student teachers were assisted to apply their insights to their own teaching. Guests in the course included Richard Suchman, Charles Lavaroni, Arthur Costa and Selma Wassermann.

	Subclass	1	2	3	4	5	6
	Subscript	1111	1112	1122	1212	1222	2222
Week	Treatment*						
1, 2	Pre treatment videotape	X	X	X	X	X**	X
	Behavior coding training (schedule A)	X	X	...	X	...	...
	Self-coding (schedules A & B)	X	...	...	...	...	...
	Behavior coding training (schedules A & B)	X	X	...	X	...	...
3, 4	Second videotape	X	X	X	...	...	...
	Self-coding (schedules A, B & C)	X	...	...	...	...	...
	Behavior coding training (schedules A, B & C)	X	X	...	X	...	...
5, 6	Third videotape	X***	X	X	...	...	...
	Self-coding (schedules A, B, C & D)	X	...	...	...	...	...
7, 8	Post treatment videotape	X	X	X	X	X	X

*For groups 1, 2, 3, 4 and 5 inquiry orientation (the Social Science curriculum course) preceded the pre treatment videotape and continued for the duration of the experiment.

**All subjects were videotaped for data-gathering purposes; members of groups 4, 5 and 6 did not view their videotapes.

***For five of the eight subjects in subclass 1 no fourth videotape was obtained and the third tape was analyzed as the post treatment tape.

FIGURE 2.

SCHEDULE OF TREATMENTS

Self-confrontation (video tape). The treatment factor identified as self-confrontation involved the subject's use of the video tape recording as a means of obtaining feedback about his interaction with pupils in the classroom. This must be distinguished from the use of video tape recording for data gathering since all subjects were video taped at the beginning and at the end of the experiment for the latter purpose. Those for whom self-confrontation was not a part of the treatment were not permitted to view their first video tapes until the experiment was concluded.

To make self-confrontation possible for a subject, the investigator made an advance appointment with him at the subject's convenience to video tape fifteen to twenty minutes of classroom interaction between student teacher and pupils. The resulting video tape was labelled and made available to the subject to view when he wished and as often as he wished. When the subject wished to view his tape he could obtain it from the research room on any weekday from 8 a.m. to 5 p.m. and by taking it to the Education Media Center he could view it immediately. The subject was encouraged to view his video tape as soon as possible after a session was recorded and requested to view it within a week. It was suggested that he view it right through once without attempting to record criticisms although he might note his reactions. Additional viewings would permit him to observe elements he wished to examine and strengths or weaknesses he wished to note. Student teachers were asked to write down their reactions to the self-confrontation including self-criticism and self-praise. They were free to invite their instructors, their supervisors, or their peers to watch the video tape with them but it was stressed that the video tape was for their personal use and would not be considered in any grading that might take place in the curriculum course or in the supervised teaching. On the occasions when student teachers asked the researcher's evaluation of their teaching based on his observation in the classroom and his viewing of the tape, he intentionally avoided reference to the categories of the self-analysis schedules. Instead he attempted to probe the comments and responses of the subject. He took it as an opportunity to gain insight into the way the subject perceived his role and into the effect of the self-confrontation on the subject's perception.

Behavior coding. Familiarity with the operational definitions for categories in the four GSA schedules used in the study and practice in coding a sample tape using the schedules comprised this treatment factor. One schedule was introduced to subjects who were asked to study it at home and to return prepared to use it in the analysis of a video taped classroom sequence. Each subject coded several minutes of classroom interaction. Results (frequencies of tallies in each category) were compared and discussed and the same sequence was coded a second time. During the second coding the recorder was stopped frequently for discussion of the operational definitions and the specific examples being coded. Schedule B was added before the second session and Schedule C before the third. Contrary to advance plans, Schedule D was not introduced at all. Subjects in group 2 were not forbidden

to take the schedules with them when they watched their own video tapes. However, they did not systematically code their own behavior as did the subjects of group 1.

Self-coding. The nature of this treatment factor is fairly clear in the description of the GSA schedules. Subjects in group 1 not only underwent self-confrontation on video tape and participated in the training sessions for behavior coding using the schedules but also coded their own teaching behavior as they viewed it on video tape. Initially they used only Schedules A and B; on the second tape they added C and, on the third, D. These subjects specifically coded their own teaching behaviors, and answered all the questions dealing with their perception of both their real and their ideal profile or teaching style. They were required to make decisions and commitments about their behavior (to themselves, but commitments nonetheless).

Data Collection Procedures

Analysis of video tapes. Pre treatment and post treatment video tapes of each subject were saved for analysis, a total of ninety-six taped classroom sequences. Data from the analysis of video tapes were used to test experimental hypotheses and to estimate the treatment effects of the independent variables. Additional data were gathered by interview and written responses to assist in the interpretation of findings. It has been observed that the GSA is designed as a clinical intervention device rather than as a research tool. However, the investigator decided to use the GSA schedules for analysis of video tapes since they provided the most direct means of obtaining data on the criterion variables.

Video tapes were analyzed by three judges who were familiar with the GSA and had practised coding and comparing results. Inter-observer reliability was estimated using Scott's coefficient (Scott, 1955) as modified by Flanders (1965). Reliability coefficients ranged from .651 to 1.0 with coefficients higher than .850 in two-thirds of the cases examined. Intra-observer reliability (consistency over time) was also found to be high (>.850).

Additional sources of data. Data on criterion performance on the sixteen variables drawn from GSA Schedules A, B, C and D were used for all statistical analyses in this experiment. In addition to the readily-quantifiable data drawn from Schedule D, information about peer-to-peer interaction and extended interaction between the teacher and individual pupils was obtained by careful examination of the coded patterns. Moreover, data were obtained by several other means to enable the investigator to interpret findings. GSA schedules used for self-analysis by subjects in the full treatment group were obtained in order to ascertain the subject's own perception of this teaching behavior as he analyzed it. Answers to questions in

which the subject drew inferences about the effects of his behavior on pupil thinking and described desired changes in his own teaching behavior were expected to be of greatest value to the investigator.

All subjects who experienced self-confrontation were asked to keep notes of their reactions to viewing their own behavior on video tape and of their criticism, both positive and negative, of their teaching. These comments were obtained from them for analysis by the investigator.

Interview data were obtained at every opportunity. Many interviews were both impromptu and unstructured and frequently were initiated by a subject who asked the investigator for criticism based on the latter's observation in the subject's classroom and of his video tape. In such circumstances the investigator sought to allow the subject to direct the course of the interview while he inserted probes based on observations made by the subject. These interviews provided valuable information about the subject's perception of his role, his "master teacher," his pupils and his relationships with both. Not all interviews were impromptu, however. The investigator scheduled interviews with each member of the full treatment group and with some other subjects after completion of the experiment. These interviews, too, were largely unstructured. The interview was initiated by a statement such as, "You could help me a lot if you would tell me how you felt about self-analysis," or "I was interested in what you said about ... (in your notes). Could you tell me more about it?" Once the interview was underway, the interviewer attempted to play the role of an interested and reflective listener, structuring the interview minimally. Interest was expressed, examples sought, and meanings clarified. The interviews were rich in data and contributed substantially to the interpretation of findings.

Plan of the Analysis

Independent variables. The following four independent variables were chosen as important in the context of the experiment and/or inherent in the nature of the GSA:

Factor (A) - Inquiry Orientation

Factor (B) - Self-Confrontation

Factor (C) - Behavior Coding

Factor (D) - Self-Coding

Levels. Only two levels were considered for each factor, included or excluded.

Choice of risk level, α. Partially on the basis of this experiment recommendations will be made regarding teacher education and funding may be sought for continued experimentation. Therefore, even though the risk of Type II error was considered relatively high, it was decided to choose a reasonably small Type I risk, $\alpha = 0.05$. All decisions were made at that level and other values of α are reported solely to establish trends.

Dependent (criterion) variables. The dependent variables were of two types, those obtained directly from analysis of video tape recordings and those derived from the direct variables.

From the sixteen direct variables five indices of interaction were derived as follows:

1. Questioning strategies — $\frac{\text{leading + probing}}{\text{rhetorical + basic}}$
2. Response strategies — $\frac{\text{extending}}{\text{closure + sustaining}}$
3. Total teacher talk — $\frac{\text{questions + responses}}{\text{instruction + discipline + other}}$
4. Teacher/pupil talk patterns — $\frac{\text{proportion of teacher talk}}{\text{porportion of pupil talk}}$ $\frac{\text{average length of teacher utterance}}{\text{average length of pupil utterance}}$

One final criterion variable, a general index of interaction, was computed by summing the indices derived from the first three schedules (questioning strategies, response strategies and total teacher talk) with the mean of the two indices derived from Schedule D (teacher/pupil talk patterns).

$$GII = \frac{L+P}{R+B} + \frac{E}{C+S} + \frac{Q+R}{I+D+O} + \frac{1}{2}\frac{\%P}{\%T} + \frac{1}{2}\left\{\frac{LNTH\ P}{LNTH\ T}\right\}$$

The six derived variables were used for hypothesis tests and estimates of effects were obtained for all variables in order to interpret the results of hypothesis tests with greater precision.

Statistical procedure. The major research hypothesis was tested using a factorial univariate analysis of variance with the general index of interaction as the independent variable (Table IX). This hypothesis test revealed a statistically significant treatment effect for self-coding ($p < .0005$) and no other statistically significant effects were found.

A factorial multivariate analysis of variance with the five separate indices as dependent variables was performed since one hypothesis under test was rejected. In order to determine the direction and relative size of the effect on each dependent variable least-squares estimates of effects were computed for the six indices and for the sixteen original variables.

Observed subclass means for the criterion variable, the general index of interaction, are found in Table VIII. The mean index for those who underwent guided self-analysis was almost 6 (5.83), approximately double the mean index for each of the four groups who received inquiry orientation and part or none of the self-analysis treatment, and almost four times the mean index of the no treatment control group.

The least-squares estimates of effects were computed and standardized to facilitate interpretation (Table X). Factor D, self-coding, accounted for an effect equivalent to 1.6 standard deviations on the general index of interaction.

Observed subclass means for the five indices under consideration are presented in Table XI. The questioning index is the ratio of leading and probing questions to rhetorical and basic questions. The observed mean index of the guided self-analysis group (1.92) was approximately three times as great as that of the group which experienced the full treatment except for self-coding (.67), almost five times as great as the mean of the group which received only inquiry orientation (.43), and almost twelve times as great as that of the no treatment control group (.16).

The ratio of extending responses to sustaining and closure responses is the response index. The observed mean index of the guided self-analysis group (.32) was more than double that of the group which experienced all but self-coding (.12), triple that of the inquiry orientation only group (.10), and five times that of the no treatment control group (.06).

The teacher talk index, a measure of the immediacy of interaction, is the ratio of questions and responses to all other talk. The observed mean index of the guided self-analysis group (2.89) was more than double that of the all but self-coding group (1.35) and almost triple that of the no treatment control group (.98). Unlike the trend of the two previous indices, the inquiry orientation only group had an observed mean (2.02) higher than all but the guided self-analysis group.

Two indices derived from the teacher/pupil talk patterns schedule are the ratio of total pupil talk to total teacher talk and the ratio of average length of pupil utterance to average length of teacher utterance. The only clear trend in these two indices was in the relation of the no treatment control group mean

to the means of other groups. For the two indices the control group had means of .40 and .37 respectively compared to ranges of .50 to .91 and .50 to .50 to .73 for the other groups.

In the multivariate hypothesis tests only one factor was found to have a statistically significant effect on the five indices of interaction. That factor was self-coding, p .0049 (Table XVI). The construction of confidence bounds revealed that the effect of self-coding on the questioning index alone was sufficient to account for the rejection of the multivariate hypothesis.

Estimation of Effects

Least-squares estimates of the effects of four factors and one interaction on the five indices of interaction was computed and standardized (Table SVIII). In addition estimates of effects were computed for all sixteen original criterion variables.

Questioning strategies. The interaction index for questioning strategies is designed to indicate the ratio of questions requiring more complex pupil thinking and a greater amount of pupil thinking activity to those questions requiring less complex pupil thinking and a lesser amount of thinking activity. Self-coding accounted for an effect equivalent to almost two standard deviations. Thus, for this index the group which experienced the full self-analysis treatment had a mean score of 1.294 compared to .335 for the in-class control group and .232 for the no treatment control group. Their mean ratio of higher order questions to lower order questions was more than five times greater than that of the no treatment group and two and one-half times greater than the mean of the next highest group, a group which had experienced the whole treatment except self-coding.

Examination of the least-squares estimates of effects on the original four variables under questioning strategies permits even more precise characterization of the effects of self-coding (Table XIX). Self-coding appears to account for a decrease of .844 standard deviations in rhetorical questions, a similar decrease in basic questions, an increase of .868 standard deviations in leading questions and an increase of a full standard deviation in probing questions. The self-coding group achieved a mean of 22.94% probing questions compared to 12.58% for the group which had the full treatment except for coding their own behavior, and means of 8.66% and 4.74% for the in-class and no treatment control groups respectively (Table XX).

Response strategies. The interaction index for response strategies reflects the ratio of responses which increase the complexity and amount of pupil thinking to responses which decrease or merely maintain the complexity and amount

of pupil thinking. The mean of the self-coding group (1.919) was more than doubl- that of any other group and more than ten times greater than the mean of the no treatment group (.162). Self-coding appears to have had an effect of 1.194 standard deviations on this index.

The specific nature of the effect appears to have been to decrease closure responses .713 standard deviations, decrease sustaining responses .412 and increase extending responses more than a full standard deviation, 1.141 (Table XXI). The self-coding group used fewer closure responses than any other group (9.64%), fewer sustaining responses (67.14%) and more than double the percentage of extending responses (22.49%). For the self-coding group over three of every ten responses to students were extending. For all other groups only one response in ten was extending (Table XXII).

Total teacher talk. The teacher talk index is the ratio of questions and responses to all other categories of talk. It is intended to indicate the immediacy of interaction since the numerator consists of utterances intended to elicit directly a pupil response or to respond to eliciting behavior on the part of the pupil. The subsumed category, rhetorical questions, not designed to elicit a response is small enough that it should not unduly influence the index. Once again self-coding appears to have had an effect greater than a full standard deviation, 1.357 (Table XIII). The mean index of the self-coding group 2.891, is almost 50% greater than that of any other group and is close to three times greater than the mean index of the no treatment control group.

The specific effect of self-coding appears to have been to reduce instruction by one standard deviation, to increase questions more than half a standard deviation and to increase responses almost a full standard deviation. Percentage of teacher talk constituting instruction ranged from 28.39% for the self-coding group to 51.54% for the no treatment control group. Questions ranged from 44.75% to 29.09% and responses from 23.14% to 15.83% for the same groups (Table XXIV).

Teacher/pupil talk patterns. Two indices of teacher/pupil talk patterns are the ratio of total pupil talk to total teacher talk and the ratio of the average length of pupil utterance to the average length of teacher utterance. These indices are intended to reflect the extent to which a teacher allows pupils to express themselves and to develop their own ideas. Self-coding does not appear to have had a substantial effect on these indices (Table XXV) although the self-coding group had the shortest average teacher utterance and longest average pupil utterance of any group (Table XXVI).

A trend in the data. Least-squares estimates of effect suggest that Factor A, inquiry orientation, had a substantial effect even though no hypothesis relating to it was rejected at an acceptable confidence level. This trend must be interpreted with considerable caution, especially since the no treatment control group on which one side of the comparison is based was the only group to which subjects were not randomly assigned. There was an apparent effect of almost a full standard deviation on the general index of interaction. Inquiry orientation appears to be responsible for a decrease of approximately one standard deviation in rhetorical questions with two-thirds of the corresponding increase in leading questions and one-third in probing. The teacher talk index appears to have been affected about one standard deviation by inquiry orientation with more than a standard deviation's decrease in instruction, a concomitant increase in questions and a lesser increase in responses. The same factor appears to account for a decrease of .753 standard deviations in percentage of teacher talk, a similar increase in percentage of pupil talk, a decrease of 1.7 standard deviations in average length of teacher utterance and a small increase in length of pupil utterance.

Findings

1. Self-coding clearly has an effect on the verbal teaching behavior of pre-service intermediate teachers.
2. The effect of self-coding is greatest on questioning strategies, but also substantial on response strategies and total teacher talk.
3. Self-coding was effective in decreasing the frequency of such negatively-valued behaviors as rhetorical questions, basic questions, closure responses and instruction.
4. Self-coding was effective in increasing such positively-valued behaviors as leading questions, probing questions, extending responses, and questions and responses in general.
5. No factor other than self-coding and no identifiable interaction of factors was shown to have an effect on the verbal teaching behavior of pre-service intermediate teachers.
6. For one additional factor, inquiry orientation, estimated effects show a consistent trend: substantial decrease in rhetorical questions, greater increase in leading questions than in probing, major decrease in instruction, increase in questions and responses, decrease in percentage of teacher talk and length of teacher utterance, increase in percentage of pupil talk and length of pupil utterance. This trend must be interpreted with caution since subjects were not randomly assigned to the no treatment control group.

Effects of guided self-analysis. Guided self-analysis contributed to a substantial decrease in instruction with a concomitant increase in questions and responses. Moreover it enabled the teacher to change the nature of his questions and responses. Fewer questions were rhetorical and basic, more were leading and probing in nature. A decrease in responses limited pupil thinking was accompanied by an increase in responses extending pupil thinking. These findings indicate that for the population under consideration Program III of the GSA was effective in achieving the purpose for which it was designed.

The theory suggests that teachers will experience dissonance when the analysis of their own behavior shows it to be discrepant with the ideals incorporated in the coding schedules. The observations of the investigator and the reports of subjects suggest that they do indeed experience dissonance upon engaging in self-analysis. Subjects reported guilt feelings associated with such behaviors as asking a basic question. Further evidence of dissonance is the manifestation of behaviors apparently directed to reducing the resulting tension by lessening the dissonance. Almost all subjects attempted to rationalize the discrepancy on the occasion of first undergoing self-analysis. Some attempted to dismiss the GSA schedule as not reflecting the "more important" aspects of their personality, e.g., warmth. Others expressed suspicion of the "validity of quantifying" behavior. Some placed the responsibility for their teaching "style" on the pupils, the master teacher or the curriculum. The presence of the camera was also blamed for the subject's apparent shortcomings.

"Resistance" and rationalization tended to decrease on the occasion of the second experience in self-analysis and to drop off sharply on the third. The change is indicated by such statements as, "the camera and stranger in the room seemed to create an artificial classroom situation, at least during the first and second taping." Characterizations of behavior were accompanied by fewer "excuses," and statements of purpose reflected less qualified commitment to the standards incorporated in the schedules. This trend probably indicates that reintegration of a subject's cognitive map involves increasing internalization of concepts contained in the GSA and also that the positive reinforcement received by means of observed behavior change lessens the need for rationalization. Once the subject has demonstrated his ability to reduce the discrepancy by reconstructing his own behavior, he is less dependent on the defense mechanism of rationalization to maintain personality integration.

Available data support the theory that the teacher who engages in guided self-analysis is enabled to reconstruct his behavior. The knowledge and self-awareness he gains in the process of observing his own behavior and making the discriminations required in tallying the frequency of behaviors, form the basis for conscious decisions to modify behavior in particular ways. This may be illustrated at the simplest level by the subject who expressed amazement at the number of

times she used the work "okay." According to her own tally she said, "okay," twenty-nine times in ten minutes. One week later, in a similar discussion, the frequency had dropped to eight. On first consideration this may appear trivial but it is illustrative of the sensitivity teachers develop to the nature of their own interventions in classroom dialogue.

Sensitivity to the pattern and flow of classroom interaction was demonstrated in a variety of ways. One subject early progressed beyond computing the relative frequency and proportion of specific behaviors to observe that she wished to "build a continuum of thinking rather than a series of acknowledged responses." Another observed that she and her pupils were acting in parallel much of the time and were interacting with each other very little. Some subjects demonstrated concern with patterns of interaction by examining the nature of pupil responses in extra viewings of their video tapes. Several explored the relationship between their own basic and leading questions and their probing questions and extending responses. One subject noted that several pupils who appeared to be carrying on an unrelated private discussion on the periphery of the group were in fact discussing ideas central to the lesson. Another observed that pupil excitement seemed to be directly related to peer group interaction.

Almost all who underwent self-analysis noted that when pupils were deeply involved in the discussion they tended to ask probing questions themselves. this led some to determine that they would prefer to become a catalyst in the discussion rather than the focal point of all interaction. Subjects were intrigued by their "discoveries" about the relatedness of verbal behavior and in some cases, expressed amazement at the frequency of their own unpurposive interventions.

Subjects' tendency to place on others the responsibility for their own teaching behavior has been noted. Although this is to some extent rationalization, it may also reflect awareness of social reality. The social context in which teaching behavior is set, the school, may be viewed as a prescribed set of roles. Roles are interactional and complementary and any role pair involves the expectations of one and the sanctions of the other. Major deviance on the part of a student teacher from the sanctions of master teacher or pupils is likely to meet with resistance. One subject faced this situation and complained that her role in Social Studies was determined by the pattern established by her master teacher and pupils in which pupils <u>always</u> read a few pages orally and answered basic questions asked by the teacher. Another cited her own tendency to use the master teacher as a model and to imitate the behavior she observed.

Although some subjects found it hard to modify established patterns of interaction, guided self-analysis prompted them to identify specific ways in which some such patterns were dysfunctional in terms of avowed goals. They were particularly critical of certain stereotyped patterns inherent in textbook and curriculum material devised to be "teacher proof," i.e., to prescribe a specific

pattern of teacher-pupil interaction.

In spite of their observations about the inertia of social patterns and the difficulty of modifying them subjects demonstrated ability to change their behavior substantially and, in so doing, to affect patterns of interaction with others. Thus their observations may be considered as evidence of growing insight into the nature of social interaction and awareness of the interactive effects of their own behavior and the behavior of others. In some cases, teachers who engaged in self-analysis transacted different roles with pupils. When they behaved in different ways toward pupils, those pupils in response demonstrated capabilities beyond the expectations of the teachers, who, in turn, responded differently to them. Those modified transactions summed to substantially different complementary roles.

Effects of self-confrontation and behavior coding. The theory suggests that actual coding of one's own behavior is necessary if substantial change is to be accomplished. It could be argued that repeated self-confrontation on video tape would enable a teacher to develop a more realistic perception of his actual teaching behavior and thereby increase his ability to modify his behavior at will. It could also be argued that the learning of a coding system would provide a conceptual framework for consideration of the teaching-learning process and thereby enable a teacher to modify his own behavior rationally. The combination of these two factors, behavior coding and self-confrontation, might, therefore, be considered sufficient to provide for substantial reconstruction of teaching behavior. This study was designed to determine the extent to which these arguments would be supported by empirical evidence.

Self-confrontation using video tape had no statistically significant effect on the verbal behavior of pre-service intermediate teachers. For those subjects who experienced only self-confrontation, responses throughout were similar to the initial responses of subjects who underwent guided self-analysis. Much of their attention was directed to their physical appearance and to obvious mannerisms in speech and gesture. Several subjects expressed surprise, for example, at the length of their own hair. Some noted that they had changed their behavior to the extent of lessening the frequency of a distracting mannerism. When their observation extended to the pupils, they tended to note evidence of disengagement or disruption. Most did not relate this to their own behavior in any more specific way than to suggest that they must make their lessons "more interesting." Some subjects displayed a striking lack of sensitivity to the effect of their interventions on the dynamics of group interaction. One teacher effectively "tuned out" a pupil then failed to see any relation between his response and the subsequent disruption.

One subject in this treatment group proved to be a notable exception and the frequency of her probing questions and extending responses accounted for

almost half the total in her group of eight teachers. Her previous academic achievement, scores on Graduate Record Examinations and evidence from observation suggest that she was perhaps the most intelligent and sensitive subject in the study. It would appear that elements in her personality and experience enabled her to substantially modify her teaching behavior under stimulus conditions insufficient to promote behavior change in others.

The experience of behavior coding alone was not sufficient to account for a statistically significant effect on the verbal behavior of subjects in this study. Subjects demonstrated their ability to code the behavior of others with reasonable reliability without apparently gaining very much insight into the nature of their own behavior. They used the language of the GSA in describing their teaching experience and appeared to assume that their teaching behavior reflected the same reality their language did. The most extreme discrepancy may have been the subject whose Science demonstration illustrating water power was accompanied by a constant torrent of questions. Pupils could hardly get in a word, much less express a thought yet the teacher later expressed confidence that her "probing" questions had stimulated pupil thinking. The performance of this group may be considered illustrative of the capacity of the human mind for selective perception. The individual tends to perceive that which confirms his assumptions about the nature of reality. Subjects found the GSA concepts of desirable teacher behavior congenial to their professional image of the teacher. They then focused on evidence, no matter how tenuous, that their own teaching behavior reflected that image.

Subjects who experienced both self-confrontation and behavior coding claimed a resulting increase in confidence, self-awareness, and objectivity with regard to their own behavior. They felt that they had modified their behavior in terms of the GSA criteria although analysis revealed no statistically significant effect for either factor or for the interaction of the two factors. Several claimed increasing awareness of a tendency toward teacher domination and expressed a commitment to greater pupil involvement and pupil-direction in discussion.

One subject gave evidence of substantial behavior change which may have resulted from the unique strategy she developed for analyzing her own teaching behavior. She repeatedly focused on specific points in the lesson she was viewing and asked herself such questions as, "How could I use probing questions and extending responses to improve the quality of interaction and promote pupil thinking at this point?" Examination of her strategy reveals that although she did not tally the frequency of specific behaviors, she did examine those behaviors sufficiently intensively to be able to discriminate between them. She then worked to devise alternative strategies for use in similar contexts and consciously attempted to implement those alternatives in later teaching. Her

motivation to improve her performance was sufficiently strong that she took advantage of the experiences provided and devised a personal strategy which incorporated elements of guided self-analysis.

For subjects who did not undergo guided self-analysis, little evidence of dissonance appeared to accompany self-confrontation or behavior coding. Expression of guilt feelings and attempts to rationalize were atypical for them unlike those who actually coded their own behavior. This suggests that selective perception was sufficient for them to maintain personality integration without extensive resort to other mechanisms of ego defense.

Self-confrontation does indeed provide a teacher with the opportunity to make a realistic assessment of his own teaching behavior. Learning a system for categorizing teaching behavior and applying it to the analysis of another teacher's behavior does provide a framework for conceptualizing the teaching-learning process. However, the evidence suggests that the actual coding of one's own behavior is required to activate the effects of the other two factors sufficiently for the effect to be observable in behavior. The effects of self-confrontation and behavior coding appear to be largely lost apart from the dissonance induced by the intensive experience of tallying the frequency of specific behaviors in one's own functioning as a teacher. Once that experience is provided the other two factors become operative in the reintegration of cognitive structure and the reorganization of behavior.

Effects of inquiry orientation. A consistent trend in the data suggests that the curriculum course effected a decrease in rhetorical questions, an increase in leading questions, a decrease in proportion of teacher talk devoted to instruction, and an increase in both questions and responses. These changes in the quality of teacher talk were accompanied by a decrease in the proportion of teacher talk and in the average length of teacher utterance and an increase in the proportion of pupil talk and average length of pupil utterance.

It has been noted that subjects who experienced self-confrontation and behavior coding expressed the belief that they had modified their behavior in terms of the GSA criteria. By comparison with the no treatment control group they had so modified their behavior even though it remained equivalent with that manifested by those who only took the Social Science curriculum course. It is possible that the effect of the curriculum course masked an effect which would have occurred without it as a result of self-confrontation and/or behavior coding.

A major element in the curriculum course was the modeling of desirable teacher behavior manifested both in video tape excerpts and in the behavior of the instructor. On more than one occasion pre-service teachers in the curriculum

course without invitation, subjected their instructor's behavior to analysis using the coding schedules of the GSA. Several subjects independently informed the investigator that his exemplification of teaching behaviors had made a major contribution to their learning. Most of these subjects were in the group which had experienced guided self-analysis. It may be more than coincidental that the teacher who shows the greatest willingness to emulate a model is the one who has analyzed his own behavior, found it inadequate, and is seeking for alternative modes of behavior.

Suggestions for Further Research

The current study was designed solely to determine the effects on the verbal behavior of pre-service teachers of three factors inherent in the GSA approach to professional development. Tentative answers have been found for the questions asked. However, the effect of guided self-analysis over an extended period of time remains to be studied. Effects might also be investigated by methods other than using the coding schedules themselves. Different populations, e.g., pre-service and in-service teachers could be studied and the effects on pupils must be examined together with the impact on the school as a social system.

The extent to which modified teaching behavior stabilizes and perseveres over an extended period of time must be of concern in any program for professional development. The theory suggests that behavior change accompanied by change in cognitive structure will tend to endure. The collection and analysis of data about the teaching behavior of subjects in this study after a period of months or even years had elapsed would contribute to answering this question although interpretation of findings would be rendered difficult by uncontrolled intervening variables in the divergent histories of the respective subjects.

Further investigation should be undertaken to gain greater information about the behavior change which takes place in teachers who experience guided self-analysis. One might ask whether such teachers merely acquire a different profile of teaching behavior which in turn becomes just as stable across different contexts as that of the most rigid traditional teacher, and perhaps just as resistant to change. The theory and present data would suggest that increased sensitivity to social interaction, increased self-awareness, and the analytical skill to examine his own behavior would render the teacher more flexible and capable of adapting his behavior according to his purposes. The question requires further empirical investigation.

The implementation of a GSA program for both student teachers and master teachers would provide the basis for an interesting study. Although some pre-service teachers seek to emulate their master teachers, others consciously

define their identity in contradistinction to that of their master teacher. They view themselves as social revolutionaries and, in order to maintain that role, must view their master teachers (or at least most teachers) as reactionary. The words, "You think that's bad. You should see my master teacher!...," are frequently heard as student teachers exchange "atrocity stories" about their "traditional" master teachers. Allowing the student teacher alone to participate in guided self-analysis does little for his relationship with the master teacher. The pre-service teacher develops a cognitive structure for which the experienced teacher lacks equivalence and, unless there is a strong desire to transact equivalence, little productive communication will take place. Encouraging both to experience guided self-analysis might facilitate the establishment of dialogue and a co-operative approach to their mutual goal of promoting learning.

The divergent orientation of pre-service and in-service teachers has been noted. It is illustrative of the dialectical process of which Mannheim wrote in Ideology and Utopia (Mannheim, 1936). One element appears to be committed to maintenance of the status quo, the other to transforming the status quo. Many student teachers experience considerable ambivalence about receiving the sanction of their master teacher. The theory suggests that the effectiveness of the GSA depends on tapping identity aspects which have great salience for the individual. If indeed the GSA proves to effect behavior change in both pre-service and in-service teachers, it would be of interest to determine the source of salience for each. It might be, for example, that the emphasis on teaching for inquiry has salience for the in-service teacher because it coincides with his professional image which includes verbal assent to the goal of "teaching for thinking." Teaching for inquiry may have salience for the pre-service teacher because of its congruence with his image of himself as a social revolutionary. Giving the pupil greater autonomy is consistent with his slogan of "power to the people." These questions, too, can be studied empirically.

The ultimate evaluation of any program for professional development must employ criteria other than teacher behavior per se. Such a program is intended to promote learning and it is to the pupils that one must turn in order to determine a program's effectiveness. In the evaluation of the GSA attention must be given to its effect on pupil achievement, pupil attitude, and the development of social skills and thinking skills.

Planned Implementation of GSA Programs

Pre-service. The Professional Development Program at Simon Fraser University is incorporating the GSA into a four-month internship phase of the student teacher's experience. Master teachers will be encouraged to

engage in GSA concurrently with their student teachers. The following effects are anticipated:

1. Increase in the ability of student teachers to plan and carry out a program of professional development and to learn from their experience.

2. A more productive relationship between student teacher and master teacher facilitated by transaction of greater equivalence in cognitive structuring of the teaching/learning process.

3. Increased in-service effect from service as a master teacher and, therefore, enhancement of a mutually beneficial relationship between the university and the schools.

In-service. In addition to the in-service training effect of participation in pre-service education, teachers will be provided the opportunity of engaging in a new type of M.A. program focused upon professional development. In the first summer of the program, the teacher prepares a plan for his own development. His own classroom will be the laboratory setting and he will undertake a project in curriculum development or instructional programming. Summer and extension courses will be undertaken not for isolated credit but to gain specific competencies required for an individual project. The GSA will be a required integral part of the program to enable the teacher to gain a more realistic perception of his teaching behavior so that his M.A. program will affect his actual performance.

Program evaluation. Empirical data will be collected systematically on these applications of the GSA procedure so that programs can be evaluated and modified on the basis of evidence rather than feelings.

TABLE VIII

OBSERVED SUBCLASS MEANS

GENERAL INDEX OF INTERACTION

		Dependent variable
Subclass	Subscript*	General index of interaction
1	1111	5.82590
2	1112	2.85438
3	1122	2.30419
4	1212	2.85178
5	1222	3.30704
6	2222	1.59045

*The subscript numerals refer to two levels (level 1 - included and level 2 - excluded) of the four treatment factors (inquiry orientation, self-confrontation, behavior coding and self-coding) respectively.

TABLE IX

ANALYSIS OF VARIANCE

GENERAL INDEX OF INTERACTION

Source of variation	Degrees of freedom	Hypothesis mean square	F*	P<
Inquiry orientation	1	9.8143	2.9624	.0926
Self-confrontation	1	2.0010	.6040	.4415
Behavior coding	1	.0180	.0054	.9416
Self-coding	1	47.4873	14.3326	.0005
Residual	42	3.3130		

*Critical value - $F_{.05}$ (1, 42) = 4.06

TABLE X

STANDARDIZED LEAST-SQUARES ESTIMATES OF EFFECTS*

GENERAL INDEX OF INTERACTION

Function	Estimates (standardized) General index of interaction
1. General mean	....
2. Inquiry orientation - no inquiry orientation	.943078
3. Self-confrontation - no self-confrontation	-.274767
4. Behavior coding - no behavior coding	.026080
5. Self-coding - no self-coding	1.632524
6. Interaction, self-confrontation and behavior coding	.138095

*Estimates are standardized by dividing the least-squares estimate by the standard deviation of the appropriate variable.

TABLE XI

OBSERVED SUBCLASS MEANS

INDICES OF INTERACTION

		Dependent variable				
		Teacher Questions	Teacher Responses	Teacher Talk	Percentage Total Talk	Length of Utterance
Sub-class	Sub-script*	L+P / R+B	E / S+C	Q+R / I+D+O	Pupil / Teacher	Pupil / Teacher
1	1111	1.91936	.31792	2.89095	.69672	.69862
2	1112	.67154	.12478	1.35207	.90787	.50410
3	1122	.50937	.16424	1.13572	.54393	.44578
4	1212	.84124	.09527	1.39534	.49695	.54293
5	1222	.42989	.10346	2.02235	.76939	.73328
6	2222	.16209	.06459	.97776	.39975	.37226

*The subscript numerals refer to two levels (level 1 - included and level 2 - excluded) of the four treatment factors (inquiry orientation, self-confrontation, behavior coding and self-coding) respectively.

XII TABLE XIII

MULTIVARIATE ANOVA HYPOTHESIS TEST

EFFECTS OF INQUIRY ORIENTATION

Variable	Mean square	Univariate F*	p less than
1. Questioning ratio	.4981	1.2625	.2676
2. Response ratio	.0100	.3807	.5406
3. Teacher talk ratio	3.1778	2.4699	.1236
4. Pupil/teacher talk ratio	.2027	.3903	.5356
5. Length of utterance ratio	.4083	2.3944	.1293

*$F_{.05}$ (1, 42) = 4.06 (critical value for univariate tests)

Multivariate test

θ_s = .1230 d.f. = 5 and 38

F = 1.0656 p < .3946

TABLE XIV

MULTIVARIATE ANOVA HYPOTHESIS TEST

EFFECTS OF SELF-CONFRONTATION

Variable	Mean square	Univariate F*	p less than
1. Questioning ratio	.0163	.0413	.8401
2. Response ratio	.0163	.6231	.4344
3. Teacher talk ratio	1.7294	1.3442	.2529
4. Pupil/teacher talk ratio	.0688	.1325	.7177
5. Length of utterance ratio	.2130	1.2491	.2701

*$F_{.05}$ (1, 42) = 4.06 (critical value for univariate tests)

Multivariate test

θ_s = .1852 d.f. = 5 and 38

F = 1.7269 p < .1520

TABLE XV

MULTIVARIATE ANOVA HYPOTHESIS TEST

EFFECTS OF BEHAVIOR CODING

Variable	Mean square	Univariate F*	p less than
1. Questioning index	.6578	1.6674	.2037
2. Response index	.0045	.1735	.6792
3. Teacher talk index	.3373	.2622	.6114
4. Pupil/teacher talk index	.0167	.0322	.8584
5. Length of utterance index	.0349	.2044	.6535

*$F_{.05}$ (1, 42) = 4.06 (critical value for univariate tests)

Multivariate test

θ_s = .1344 d.f. = 5 and 38

F = 1.1803 p < .3369

TABLE XVI

MULTIVARIATE ANOVA HYPOTHESIS TEST

EFFECTS OF SELF-CODING

Variable	Mean square	Univariate F*	p less than
1. Questioning index	6.4251	16.2850	.0003
2. Response index	.1570	5.9996	.0186
3. Teacher talk index	13.9955	10.8780	.0020
4. Pupil/teacher talk index	.0124	.0239	.8780
5. Length of utterance index	.3021	1.7665	.1910

*$F_{.05}$ (1, 42) = 4.06 (critical value for univariate tests)

Multivariate test

θ_s = .3471 d.f. = 5 and 38

F = 4.0409 p < .0049

TABLE XVII

MULTIVARIATE ANOVA HYPOTHESIS TEST

EFFECTS OF SELF-CONFRONTATION, BEHAVIOR CODING INTERACTION

Variable	Mean square	Univariate F*	p less than
1. Questioning index	.1242	.3147	.5778
2. Response index	.0020	.0747	.7860
3. Teacher talk index	1.4225	1.1056	.2991
4. Pupil/teacher talk index	.8100	1.5599	.2186
5. Length of utterance index	.1237	.7253	.3993

*$F_{.05}$ (1, 42) = 4.06 (critical value for univariate tests)

Multivariate test

θ_s = .0844 d.f. = 5 and 38

F = .7007 p < .6264

TABLE XVIII

STANDARDIZED LEAST-SQUARES ESTIMATES OF EFFECTS*

INDICES OF INTERACTION

Function	Teacher Questions $\frac{L + P}{R + B}$	Teacher Responses $\frac{E}{S + C}$	Teacher Talk $\frac{Q + R}{I + D + O}$	Percentage Total Talk $\frac{\text{Pupil}}{\text{Teacher}}$	Length of Utterance $\frac{\text{Pupil}}{\text{Teacher}}$
1	....	....	....	....	....
2	.426365	.240235	.920912	.512961	.874328
3	-.071820	.279408	-.409900	.128684	-.395156
4	.456552	-.147219	-.181195	.063489	-.159869
5	1.986658	1.193696	1.356678	-.293020	.471107
6	-.099172	.048331	.185877	.220788	.150569

Function 1 General mean

2 Inquiry orientation - no inquiry orientation

3 Self-confrontation - no self-confrontation

4 Behavior coding - no behavior coding

5 Self-coding - no self-coding

6 Interaction, self-confrontation and behavior coding

*Estimates are standardized by dividing the least-squares estimate by the standard deviation of the appropriate variable.

TABLE XIX

STANDARDIZED LEAST-SQUARES ESTIMATES OF EFFECTS*

QUESTIONING STRATEGIES

Function	Estimates (standardized) Teacher questions			
	Rhetorical	Basic	Leading	Probing
1. General mean	....	....	....	....
2. Inquiry orientation - no inquiry orientation	-1.071	-.118	.767	.379
3. Self-confrontation - no self-confrontation	.669	-.335	-.154	.193
4. Behavior coding- no behavior coding	-.416	-.418	.574	.185
5. Self-coding no self-coding	-.844	-.733	.868	1.000
6. Interaction, self-confrontation and behavior coding	-.156	.208	-.324	.182

*Estimates are standardized by dividing the least-squares estimate by the standard deviation of the appropriate variable.

TABLE XX

OBSERVED SUBCLASS MEANS

QUESTIONING STRATEGIES

Subclass	Subscript*	Dependent variable: Percentage of teacher questions Rhetorical	Basic	Leading	Probing
1	1111	9.6500	31.2375	36.1750	22.9375
2	1112	19.7750	43.8625	23.7750	12.5750
3	1122	28.5125	43.8875	24.8125	6.9000
4	1212	15.5000	42.4500	35.2125	6.8125
5	1222	16.7375	56.8250	17.7625	8.6625
6	2222	29.5875	58.8625	6.8125	4.7375

*The subscript numerals refer to two levels (level 1 - included and level 2 - excluded) of the four treatment factors (inquiry orientation, self-confrontation, behavior coding and self-coding) respectively.

TABLE XXI

STANDARDIZED LEAST-SQUARES ESTIMATES OF EFFECTS*

RESPONSE STRATEGIES

Function	Estimates (standardized) Teacher responses		
	Closure	Sustaining	Extending
1. General mean	....	....	....
2. Inquiry orientation - no inquiry orientation	-.204	-.057	.269
3. Self-confrontation - no self-confrontation	.438	-.539	.253
4. Behavior coding - no behavior coding	.127	-.056	-.067
5. Self-coding - no self-coding	-.713	-.412	1.141
6. Interaction, self-confrontation and behavior coding	-.051	.039	-.011

*Estimates are standardized by dividing the least-squares estimate by the standard deviation of the appropriate variable.

TABLE XXII

OBSERVED SUBCLASS MEANS

RESPONSE STRATEGIES

Subclass	Subscript*	Dependent variable: Percentage of teacher responses		
		Closure	Sustaining	Extending
1	1111	9.6375	67.1375	22.4875
2	1112	17.0500	72.5625	10.3875
3	1122	16.8000	72.2625	11.3250
4	1212	13.5625	78.6250	7.9375
5	1222	11.1750	80.3875	8.4125
6	2222	13.3000	81.1375	5.5625

*The subscript numerals refer to two levels (level 1 - included and level 2 - excluded) of the four treatment factors (inquiry orientation, self-confrontation, behavior coding and self-coding) respectively.

TABLE XXIII

STANDARDIZED LEAST-SQUARES ESTIMATES OF EFFECTS*

TOTAL TEACHER TALK

Function	Estimates (standardized) Total teacher talk			
	Instruction	Questions	Responses	Discipline	Other
1	....	....	....	....	....
2	-1.295	1.059	.544	.679	-.139
3	.581	-.348	-.314	-.340	-.662
4	.180	.017	-.213	-.444	-.015
5	-1.012	.515	.965	.409	.092
6	-.214	.291	-.013	-.020	-.192

*Estimates are standardized by dividing the least-squares estimate by the standard deviation of the appropriate variable.

Function 1 General mean

2 Inquiry orientation - no inquiry orientation

3 Self-confrontation no self-confrontation

4 Behavior coding - no behavior coding

5 Self-coding - no self-coding

6 Interaction, self-confrontation and behavior coding

TABLE XXIV

OBSERVED SUBCLASS MEANS

TOTAL TEACHER TALK

Sub-class	Sub-script*	Dependent variable: Percentage of total teacher talk				
		Instruction	Questions	Responses	Discipline	Other
1	1111	28.3875	44.7500	23.1375	1.7500	1.6750
2	1112	43.5375	38.2625	15.9500	.5750	1.5250
3	1122	47.2500	30.7250	17.7375	1.9625	2.1750
4	1212	41.2375	35.3250	18.4875	1.6625	3.2250
5	1222	32.1375	42.4250	19.8750	2.8250	2.6250
6	2222	51.5375	29.0875	15.8250	.8750	2.8500

*The subscript numerals refer to two levels (level 1 - included and level 2 - excluded) of the four treatment factors (inquiry orientation, self-confrontation, behavior coding and self-coding) respectively.